

IN THE CLAIMS:

1. (Currently amended) A solar cell comprising:
a photovoltaic energy source having a front face and an oppositely disposed back face;
a frontside array of metallic gridlines deposited upon the front face of the photovoltaic energy source; and
a busbar structure in electrical continuity with the frontside array of metallic gridlines, the busbar structure comprising
an electrical insulator layer overlying and contacting the front face of the photovoltaic energy source, wherein the electrical insulator layer is selected from the group consisting of oxides and nitrides having a thickness of from about 0.3 to about 2 micrometers, and
a metallic busbar layer overlying and contacting the electrical insulator layer, wherein the metallic busbar layer is in electrical continuity with the frontside array of metallic gridlines.
2. (Original) The solar cell of claim 1, wherein the photovoltaic energy source comprises exactly two layers of semiconductor material.
3. (Original) The solar cell of claim 1, wherein the photovoltaic energy source comprises more than two layers of semiconductor material.
4. (Original) The solar cell of claim 1, wherein the solar cell further includes
a backside metallic electrode overlying and contacting the back face of the photovoltaic energy source.
- 5-6. (Cancel)

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7. (Original) The solar cell of claim 1, wherein the electrical insulator layer has a thickness of about 0.5 micrometers.

8. (Original) The solar cell of claim 1, wherein the electrical insulator layer extends laterally beyond the metallic busbar layer.

9. (Original) The solar cell of claim 1, further including
a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source.

10. (Original) The solar cell of claim 1, further including
a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source with a concentration ratio of more than 200 suns.

11. (Original) The solar cell of claim 1, further including
a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source with a concentration ratio of from about 300 to about 500 suns.

12. (Currently amended) A solar cell comprising:
a photovoltaic energy source comprising at least two layers of semiconductor material and having a front face and an oppositely disposed back face, wherein the photovoltaic energy source comprises more than two semiconductor layers whose pairwise semiconductor junctions are tuned to various spectral components of the sun;

a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source;

a frontside array of metallic gridlines deposited upon the front face of the photovoltaic energy source;

a backside metallic electrode overlying and contacting the back face of the photovoltaic energy source;

a busbar structure in electrical continuity with the frontside array of metallic gridlines, the busbar structure comprising

an electrical insulator layer selected from the group consisting of oxides and nitrides overlying and contacting the front face of the photovoltaic energy source, and

a metallic busbar layer overlying and contacting the electrical insulator layer, the metallic busbar layer being in electrical continuity with the frontside array of metallic gridlines.

13. (Cancel)

14. (Original) The solar cell of claim 12, wherein the electrical insulator layer has a thickness of from about 0.3 to about 2 micrometers.

15. (Original) The solar cell of claim 12, wherein the electrical insulator layer has a thickness of about 0.5 micrometers.

16. (Original) The solar cell of claim 12, wherein the electrical insulator layer extends laterally beyond the metallic busbar layer.

17. (Original) The solar cell of claim 12, wherein the solar concentrator has a concentration ratio of from about 300 to about 500 suns.

18. (New) A solar cell comprising:
a photovoltaic energy source having a front face and an oppositely disposed back face;

a frontside array of metallic gridlines deposited upon the front face of the photovoltaic energy source; and

a busbar structure in electrical continuity with the frontside array of metallic gridlines, the busbar structure comprising

an electrical insulator layer overlying and contacting the front face of the photovoltaic energy source, wherein the electrical insulator layer has a thickness of from about 0.3 to about 2 micrometers, and

a metallic busbar layer overlying and contacting the electrical insulator layer, wherein the metallic busbar layer is in electrical continuity with the frontside array of metallic gridlines.

19. (New) The solar cell of claim 18, wherein the photovoltaic energy source comprises more than two layers of semiconductor material.

20. (New) The solar cell of claim 18, wherein the electrical insulator layer is an oxide or a nitride.

21. (New) The solar cell of claim 18, wherein the electrical insulator layer extends laterally beyond the metallic busbar layer.

22. (New) The solar cell of claim 18, further including
a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source.

23. (New) The solar cell of claim 18, further including
a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source with a concentration ratio of more than 200 suns.